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ABSTRACT

This training unit on protective breathing apparatus is part of a 17-unit course package written to aid instructors in the development, teaching, and evaluation of fire fighters in the Wisconsin Fire Service Certification Series. The purpose stated for the 10-hour unit is to enable the fire fighter to perform routine fire fighting and rescue operations in smoke-filled areas and to perform routine inspection and maintenance of the breathing equipment used. An instructor's guide sheet provides this information: introduction to the topic, instructor preparation, length of unit, methods of instruction, testing, equipment and facilities required, recommended visual aids, and references. Following a list of unit objectives, a lesson plan outlines the main teaching points and states the preferred teaching method, cites the reference and page number(s) where the information is to be found, and indicates the necessary handouts. Other contents in the unit include a unit quiz, answer key to the quiz, and handouts (graphs, student worksheets, informational material, and forms). (YLB)

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FIRE SERVICE CERTIFICATION SERIES

UNIT FSCS-FF-6-80

PROTECTIVE BREATHING APPARATUS

FIRE SERVICE TRAINING

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CONTENTS

	PAGE
INTRODUCTION	1
INSTRUCTOR GUIDE SHEETS	2
OBJECTIVES	3-4
LESSON PLANS	5-19
UNIT QUIZ	20-23
ANSWER KEY	24
APPENDIX	
HANDOUT MATERIAL	25-26

PROTECTIVE BREATHING APPARATUS

Prepared by:

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Fire Service Training

INTRODUCTION

Statistics on firefighters injured each year due to inhalation of toxic gases clearly indicate that the provision of protective breathing apparatus should recieve a high priority.

It is extremely important to select a proper type breathing apparatus and then to train firefighters thoroughly in its useage and maintenance.

There should be no excuse for allowing firefighters to enter a toxic atmosphere without first donning breathing apparatus. Some cities have established madatory mask rules and suspend those firefighters who do not comply with the rules regarding the wearing of protective breathing apparatus.

The purpose of this unit is to enable the firefighter to perform routine fire fighting and rescue operations in smoke filled areas and perform routine inspection and maintenance of the breathing equipment used.

INSTRUCTOR PREPARATION

Carefully study the objectives to determine the goals that have been set for the firefighters upon completion of this unit.

Review the lesson plans and if necessary, consult the references listed.

Develop suitable audio-visual aids, provide training area and necessary tools and equipment to effectively teach this unit.

LENGTH OF UNIT

Classroom Work	3 hours
Practice	6 hours 30 minutes
Evaluation and Testing	30 minutes

METHODS OF INSTRUCTION

Lecture/Illustration/Demonstration

Suggested methods and techniques are listed under Instructor's Notes on the lesson plans. For further information consult Fire Service Instructor Training IFSTA #303 3rd ed., pp. 71-83

EQUIPMENT AND FACILITIES REQUIRED

Classroom for the projection of visual aids if they are to be used and large enough to permit practice donning of the equipment.

Breathing Apparatus necessary
Rope for tag lines
Smoke generation equipment
Audio-visual aids equipment
Hand lights
Furniture to add realism to serach area
Rescue dummy

REFERENCES

Hudiburg, E. and McCoy, C., Ed., Fire Service Rescue and Protective Breathing Practices 4th ed., #108, IFSTA, Stilllwater, 1969, pp. 9-16, 25-61.

Peige, J., Ed., Essentials of Fire Fighting, 1st ed., #200, IFSTA, Stillwater, 1977, pp. 251-261.

Manufacturer's Operation and maintenance manuals

OBJECTIVES

All objectives in this unit are to be met according to the material contained in the International Fire Service Training Association Manuals #108, Fire Service Rescue and Protective Breathing Practices, and #200 Essentials of Fire Fighting.

To satisfactorily complete this unit, the firefighter must attain a grade of 70 or higher on the written quiz and sucessfully complete the practical skills examination.

NFPA STANDARD 1001

PROTECTIVE BREATHING APPARATUS

FIRE FIGHTER I

3-3 Protective Breathing Apparatus

3-3.1 The fire fighter shall name at least four (4) hazardous respiratory enviroments encountered in fire fighting.

3-3.2 The fire fighter shall demonstrate the use, in a dense smoke envirorment, of all types of protective breathing apparatus used by the authority having jurisdiction.

3-3.3 The fire fighter shall explain the physical requirements of the wearer, the limitations of the protective breathing apparatus, and the safety features of all types of breathing apparatus used by the authority having jurisdiction.

3-3.4 The fire fighter shall demonstrate donning breathing apparatus while wearing protective clothing.

3-3.5 The fire fighter shall demonstrate that the protective apparatus is in a safe condition for immediate use.

3-3.6 The fire fighter shall demonstrate proper procedure for cleaning and sanirizing protective breathing apparatus for future use.

FIRE FIGHTER II

4-3 Protective Breathing Apparatus

4-3.1 The fire fighter shall demonstrate the correct procedure for daily inspection and maintenance of the breathing apparatus used by the authority having jurisdiction.

4-3.2 The fire fighter, given each type of breathing apparatus used by the authority having jurisdiction, shall demonstrate the correct procedure for recharging.

OBJECTIVES

FIRE FIGHTER II

4-3.3 The fire fighter shall demonstrate the correct use of emergency procedures including breathing apparatus to assist other fire fighters, conservation of air and restrictive use of by-pass valves.

COURSE: FIRE SERVICE CERTIFICATION SERIES

LESSON: PROTECTIVE BREATHING APPARATUS

EQUIPMENT NEEDED: SLIDE, OVERHEAD OR MOVIE PROJECTORS, SCREEN

TRAINING AIDS: SLIDES, TRANSPARENCIES, FILMS, TEXTS

INSTRUCTORS NOTES	TEACHING POINTS
Ref. Fire Chiefs Handbook 3rd ed., pp. 425-426	1. History of Breathing Equipment
	A. Wet rags and beards
	B. Aldini apparatus
Objectives	C. The next 100 years
3-3.2 3-3.4	1. Air pumps and hose
	2. Filter masks
are covered in the practicals skills test area	3. 1880 - oxygen rebreathing equipment England and Germany
	4. 1918 - The Gibbs oxygen rebreathing equipment - United States
	D. World War II
	1. Chemox Oxygen generating, U.S. Navy
	2. Demand regulated - from O2 systems used in aircraft
3-3.1	II. A. Hazardous Respiratory Enviroments
	1. Smoke filled buildings
	2. Manholes/Sewers
	3. Halon filled computer room
	4. Hold of a ship
	5. Underground tunnels
Lecture-Discussion Where transparencies or charts are available they may be used for this area	III. Respiratory Hazards
	A. Common Products of Combustion
	1. Carbon Dioxide (CO2) from complete combustion of carbon based fuels.

INSTRUCTORS NOTES	TEACHING POINTS
	III. Respiratory Hazards
	A. Common Products of Combustion
Emphasize CO largest killer of fire fighters	2. Carbon Monoxide (CO) from incomplete combustion of carbon based fuels
	3. Hydrogen sulfide(H2S) from rubber, certain plastics, wool silk and rayon.
	4. Hydrogen Cyanide (HCN) from same fuels as Hydrogen Sulfide.
	5. Ammonia (NH3) from fuels containing nitrogen.
	6. Sulfur Dioxide SO2 from fuels containing sulfur, such as rubber.
	B. Oxygen Deficiency
	1. First noticeable sign-faster, deeper breathing
	2. 21 - 15% - muscular skill is diminished
	3. 14 - 10% - faulty judgement and fatigue
	4. 10 - 6% - collapse but can be revived
	5. 6% - death in approximately six minutes
3-3.3	C. Hyperventilation
	1. Caused by over-exertion and heavy breathing of normal or above normal oxygenated atmosphere.
	2. Lowers level of Co2 in blood
	3. Symptoms _ dizziness, impaired vision, numbness tingling, restlessness, giddiness and unconsciousness if in advance stages.
	4. Can take place while wearing breathing equipment - take it easy.

INSTRUCTORS NOTES

TEACHING POINTS

IV. Major Prinicipies of Operation

A. Oxygen Generating -"Chemox"

1. Generates oxygen when moisture in wearers breath strikes chemical in cannister

2. Also uses oxygen rebreathing principle to some extent

3. 30 - 60 minute service time

B. Oxygen Rebreathing - Scott-Draeger

1. Uses small supply of compressed O2

2. Exhaled air of wearer is "scrubbed" and cooled and then reused

3. 2 - 4 hours service time

C. Demand Regulated - Scott "Air Pak", M.S.A., Surviv-Air, Fyr-Fyter, "Guardsman"

1. Demand regulator reduces pressure from storage cyclinder and feeds air to wearer upon demand

2. Air flows only when wearer inhales

3. 15 - 30 - 45 minute service time

4. Positive Pressure Demand breathing apparatus operates in the same manner as the demand type.

The basic diffrence between the two is that the positive pressure demand regulator is designed so that a slight positive pressure is always inside the facepiece (mask)

The purpose of this design is to provide a constant outward pressure above atomospheric pressure.. This insures that if a leak in the mask to face seal should occur, toxic gases cannot seep inside the facepiece.

3-3.3

Note: Demand-Type apparatus manufacturered after 1968 can be converted into positive pressure demand by using the manufacturers changeover kits.

Care should be taken to also change the exhalation valve of the demand mask the positive pressure would continously leak.

It must be stressed that that, at the present time, positive pressure demand apparatus offers the best protection for fire Fighters in self-contained breathing apparatus.

INSTRUCTORS NOTES

TEACHING POINTS

3-3.3

V. Limitations

The most desirable feature of self-contained breathing apparatus is that the wearer is independent of the surrounding atmosphere as long as the air supply in the tank is available.

The most common types of self-contained breathing apparatus in fire department use today are the 30-minute and 15-minute cylinders.

These time-related ratings are frequently misunderstood and problems are encountered if the ratings are applied literally.

The actual "duration of support" is dependent on the individuals physiological and psychological conditioning..

The duration of any units usefulness is dependent upon:

A. Air pressure in tank at start

B. Air consumption of the individual

Approximate operating time is 30 minutes if tank is full at start

A. In fire fighting operations this operating time drops considerably due to added consumption:

1. Extreme exertion

2. Confusion in smoke filled buildings

3. Excitement

REMEMBER No one should enter any area without self-contained breathing apparatus, inwhich there is:

Noxious or toxic gases

Excessive heat

Smoke

It is suspected or known that there is an oxygen deficient atmosphere

REMEMBER

Self-contained breathing apparatus will not protect against toxic atmospheres that are capable of irratating or poisoning thru the skin.

INSTRUCTORS NOTES

TEACHING POINTS

VI. Major Components, Their Purpose, and Use

A. Demand Regulated

1. Carrying Assembly

a. harness
b. frame for cylinder
c. purpose-to attach equipment to wearer

2. Cylinder Assembly

a. bottle, tank, cylinder
b. valve
c. gauge
d. safety valve
e. purpose-to carry air for use

3. Demand Regulator Assembly

a. high pressure hose - to carry air from tank to regulator

b. low pressure alarm-sounds when pressure reaches approximately 400 p.s.i. or 3 - 5 minutes of air

c. demand regulator - reduces cylinder pressure to approximately 35 p.s.i. allowing air to flow on inhalation cycle

d. main line valve (yellow) - controls flow to regulator, leave open except when using by-pass valve

e. by-pass valve (Red) - by-passes regulator in case of regulator malfunction, open only when needed. DO NOT BLEED REGULATOR WITH THIS VALVE.

f. regulator gauge - for wearer to keep track of air useage

4. Face piece and breathing tube assembly - tube carries air to face piece which protects wearers eyes, provides seal from outside atmosphere and contains exhalation valve to exhaust exhaled air.

INSTRUCTORS NOTES	TEACHING POINTS
	VI. Major Components, Their Purpose and Use B. Others 1. Carrying assembly 2. Cannister-"Chemox" - oxygen generating contains chemical to release oxygen 3. Oxygen tank - oxygen rebreathing - contains a supply of oxygen 4. Coolers and Scrubbers - remove carbon dioxide from exhaled air and cool air for rebreathing 5. Lungs-"Chemox" - collect and store oxygen 6. Facepiece assembly VII. Inspection and Servicing
3-3.5	A. Pre-Use Safety Check - to be performed prior to each use: 1. Demand or Positive Pressure Demand Regulator Type a. Completeness check (1) Mask and breathing tube assembly (2) Cylinder and valve assembly (3) Regulator and Hose assembly (4) Harness and backplate assembly complete with all straps (5) Case (where applicable) (a) cleanliness (b) general condition (c) spare parts, wrenches, record tags, manuals b. Check tank pressure c. Turn main tank valve on d. Regulator main valve should be on e. Regulator by-pass valve should be closed f. Hose connections and valves should be finger tight g. Mask should have airtight seal

INSTRUCTORS NOTES

TEACHING POINTS

VII. Inspection and Servicing

A. Pre-Use Safety Check - to be performed prior to each use:

1. Demand or Positive Pressure Demand Regulator Type

g. cont.

(1) User should inhale deeply while obstructing the end of low pressure hose with the palm of hand.

h. Functioning of regulator should be checked by breathing deeply several times.

B. After Each Use

1. Demand or Positive Pressure Demand Regulator Type

a. Cylinder - replace or refill

b. Condition check

(1) Visually examine the breathing tube and facepiece assembly, including the exhalation valve for any signs of:

(a) wear

(b) deterioration

(c) wrinkling

(d) broken parts

(2) Pull or stretch the breathing tube to check for cracking or checking. If excessive have it replaced

3-3.6

c. Clean and disinfect

Depending on the cleaning procedure adopted, each fire fighter should be briefed on the cleaning procedure.

In addition to cleaning the entire device, the facepiece and breathing tube should be disinfected.

INSTRUCTORS NOTES	TEACHING POINTS
	VII. Inspection and Servicing
3-3.6	B. After Each Use
	1. Demand or Positive Pressure Demand Regulator Type
	c. Clean and disinfect
	(1) Separate facepiece and breathing tube from remainder of device
	(2) Wash facepiece and breathing tube in cleaner-disinfectent or detergent solution. Use sponge to facilitate removal of dirt.
	(3) Rinse completely in warm water
	(4) Air-dry in clean area
	(5) Damp sponge the regulator, harness and back plate.
	(6) Inspect all parts as indicated in para B sec. 1-a and 1-b.
	(7) Reassemble device and arrange in storage rack or container in ready position.
4-3.1	C. Daily Inspection
	1. Demand or Positive Pressure Demand Regulator Type
	a. This is generally done at the beginning of the tour of duty.
	(1) Check cylinder pressure
	(2) Turn main cylinder valve on
	(3) Regulator main line valve should be on with locking device in locked position
	(4) Regulator by-pass valve should be closed
	(5) Facepiece and low pressure hose should be disconnected from regulator
	(6) Check pressure gauge on regulator (Should show same pressure as cylinder valve pressure gauge)

INSTRUCTORS NOTES

TEACHING POINTS

VII. Inspection and Servicing

C. Daily Inspection

(7) Close main cylinder valve

(8) Breathe air from regulator by placing mouth directly over inhalation port on regulator

This performs two important checks:

(a) As pressure is reduced in regulator and high pressure hose the alarm device should sound at between 400 to 600 PSI

(b) After all the air has been drawn from the regulator and high pressure hose (main cylinder valve closed) continue to try to draw air from the inhalation port. If air continues to be drawn thru regulator, take unit out of service, as this is an indication of a regulator malfunction.

NOTE: Do not use the by-pass valve to bleed air from regulator. Constant use of the by-pass valve will deteiorat the seals.

(9) Don the equipment while wearing bunker coat to check for proper harness adjustment

(10) Check facepiece and low pressure hose for cracks, deterioration and proper seal.

D. Monthly Inspection

1. Demand or Positive Pressure Demand Regulator Type

a. Check cylinder pressure

Refer to paragrah B - After Each Use Section 1-b

b. Condition check

c. Leak check

Apply soapy water to:

(1) the cylinder
(2) valve connector
(3) relief device
(4) pressure gauge connection

INSTRUCTORS NOTES

TEACHING POINTS

VII. Inspection and Servicing

D. Monthly Inspection

c. Leak check

(5) regulator hose to valve connection
(6) to the regulator
(7) open cylinder valve and apply soapy water to the valve stem (Expanding bubbles indicate leakage.
(8) Turn off cylinder valve and observe any decrease in pressure as indicated on the regulator gauge (a decrease in pressure indicates leakage) Use soapy water to isolate

d. Operational check

(1) Check the integrity of the diaphragm by gently pressurizing the regulator outlet with an exhalation. (There should be no indication of escaping air from the regulator

(2) Don the apparatus and operate in a normal manner. (Air should flow to the wearer only during inhalation or when the by-pass valve is opened. (Any other air flow in the facepiece would indicate a malfunction.

e. Correct Deficiencies

All repairs to the apparatus are limited by the amount and degree of repair as authorized by the manufacturer and the training received by the individual.

f. Reassemble device and arrange in storage rack or container in ready position.

VIII. Donning Breathing Equipment (general Methods)

A. Overhead Method

1. Cylinder valve should be opened completely before starting the donning procedure

2. Lift tank (valve up) with backplate facing user

3. Push tank back over the head while allowing shoulder straps to fall onto shoulder

4. Let tank rest on shoulders while cinching straps tight

INSTRUCTORS NOTES	TEACHING POINTS
3-3.4 Ref. Fire Service Rescue and Protective Breathing Practices, 4th ed., IFSTA pp. 35-38	VIII. Donning Breathing Apparatus (General Methods) B. Coat Method 1. Lift assembly by shoulder strap and slide opposite arm through it's strap 2. Shift weight and slide other arm into it's strap 3. Remainder of procedure same as over the head method.
pp. 42-45	C. Vehicle Mounted Method 1. Back up to apparatus 2. Insert both arms and shoulder apparatus 3. Pull forward to disengage unit from mount 4. Remaining procedure same as for over the head or coat method
pp. 25-27	D. The Facepiece 1. Loosen head harness strap so that the tab end of each strap is against the facepiece buckle, With both hands fold these straps in a bundle across the top of the facepiece. Hold facepiece and straps by grasping the upper sides with both hands. 2. Place the chin well into the small pocket at the bottom of the facepiece and fit the facepiece to the temples and forehead. 3. Release the facepiece with both hands, but hold secure to the harness and pull the harness over the top of the head. 4. Tighten the chin straps first by pulling out and back on the tabs provided. This operation secures the facepiece in position and places the head harness on the back of the head so that the bottom strap is across the back of the neck and below the ears. 5. Tighten temple straps next and further secure the facepiece snugly to the head.

INSTRUCTORS NOTES	TEACHING POINTS
Ref: Fire Service Rescue and Protective Breathing Practices, 4th ed., IFSTA pp. 25-27 3-3.4	VIII. Donning Breathing Equipment (General Methods) D. The Facepiece 6. Tighten the top strap/straps last. 7. Notice that the head harness is placed at the back of the head, not on top. If the top straps are tightened first, the head harness may be pulled out of position. 8. Test facepiece for leakage by inhaling deeply while obstructing the end of the low pressure hose with the palm of the hand or by squeezing the breathing tube and trying to inhale. If the facepiece is maintaining a seal it should collapse against the face,
Ref: Essentials of Fire Fighting, 1st ed., IFSTA p. 260	IX. Safety Precautions Federal OSHA Standards state: "PERSONS SHOULD NOT BE ASSIGNED TO TASKS REQUIRING USE OF RESPIRATORS UNLESS IT HAS BEEN DETERMINED THAT THEY ARE PHYSICALLY ABLE TO PERFORM THE WORK AND USE THE EQUIPMENT. That statement applies to the private sector. MORE COMPREHENSIVE CAUTIONS should apply to fire fighters. When using self-contained breathing apparatus, the following items should be remembered and observed for maximum safety.
3-3.3	1. A fire fighter with arespiratory ailment should not perform duties requiring the use of protective breathing apparatus 2. Demand breathing apparatus should not be used immediately after performing strenous work 3. The so-called 30-minute breathing apparatus should be expected to last 1-minute for every 100 psi as indicated on cylinder gauge EXPECT NO MORE 4. The "Main-Line" valve should always be open and locked. 5. The "By-Pass" valve should always be closed. Use the "By-Pass" valve is for emergency only

INSTRUCTORS NOTES	TEACHING POINTS
3-3.3	IX. Safety Precautions 6. When "By-Pass" must be used, "main-Line" valve must be closed 7. Once entering a contaminated area, breathing apparatus should not be removed until you have left contaminated area. Because visibility improves does not insure that the area is free of contamination. 8. When working in breathing apparatus, work in pairs.
4-3.3 Ref: Essentials of Fire Fighting, 1st ed., IFSTA pp. 260-261	X. Emergency Situations The emergencies created by the malfunction of demand type breathing apparatus can be overcome in several ways. In all of these emergencies, the conservation of air is of the utmost importance. When it is necessary to use the "By-Pass" valve due to malfunction of the regulator, the following procedures should be used: 1. Open "By-Pass" valve slowly just to a point where you can breathe comfortably 2. Close "Main-Line" valve. 3. To conserve air, take a deep breath and hold it. Shut "By-Pass" valve off until you need another breath. Continue procedures in steps 1 - 3 until you are out of contaminated area. Another emergency situation is when the facepiece is damaged during fire fighting operations such as: a. broken harness b. torn facepiece c. torn breathing tube d. faulty exhalation valve In these cases proceed as follows: 1. Disconnect breathing tube from regulator 2. Remove face mask 3. Loosen body harness

INSTRUCTORS NOTES	TEACHING POINTS
Ref: Essentials of Fire Fighting, 1st ed., IFSTA pp. 260-261	X. Emergency Situations
	4. Lift regulator to your mouth and breathe directly from the threaded connection on the regulator
4-3.3	Running out of air while in a contaminated area is the most frequent emergency encountered. This situation can be overcome by a procedure called "Buddy Breathing".
	Buddy Breathing is performed by two persons. When one person runs out of air, the second person shares their air until both are out of the contaminated area.
	1. Both fire fighters loosen their breathing tubes at the regulator
	2. The fire fighter without air removes the tube from the regulator and covers the end or squeezes the tube while holding breath.
	3. The fire fighter with the air supply takes two breaths from that supply and removes the tube from the regulator
	4. The fire fighter without air then places the breathing tube into the partners regulator and takes two or three breaths
	5. They continue taking turns in this manner until they are clear of the contaminated area.
	6. During this procedure, the two fire fighters should maintain body contact, especially if the visibility is poor.
4-3.2	XI. Recharging Cylinders
p. 259	Recharging of air cylinders is usually done from a bank of large air cylinders. In some cases the large cylinders are connected to an air compressor designed specifically for air breathing systems. This system is called a "Cascade System".
	1. Attach filler hose from cascade system to the breathing apparatus cylinder to be recharged
	2. Open the tank valve on the cylinder to be recharged

INSTRUCTORS NOTES

TEACHING POINTS

XI. Recharging cylinders

3. Slowly open the fill valve on the cascade system. Filling should always be done slowly to keep heat in cylinder at a minimum, insuring proper pressure in cylinder being refilled

4. When refilled cylinder reaches fully charged pressure (see manufacturers instructions) close cascade system valve. Then close refilled cylinder valve. Slowly disconnect filler hose.

UNIT QUIZ

1. List four (4) hazardous respiratory enviroments.

_____

_____

_____

_____

2. Hyperventilation is usually the result of:

(Circle the letter at the correct answer)

a. Carbon Monoxide

b. Low oxygen supply

c. Over exertion

d. Carbon Dioxide

3. When the oxygen supply is reduced to 6% or less a human being will

_____

4. Briefly explain the operation of "Chemox breathing equipment

_____

_____

5. List five (5) common products of combustion that are hazardous to fire fighters

_____

_____

_____

_____

_____

6. Briefly explain the operation of the Oxygen Rebreathing Apparatus

_____

_____

7. The demand regulator _____ pressure from storage cylinder and _____ air to wearer on demand.

(Circle letter at the correct answer)

a. increases-restricts

b. reduces-feeds

c. cleans-cools

d. none of the above

8. Briefly explain the difference between the demand regulator type and the positive pressure demand type of breathing apparatus.

_____

9. List two (2) conditions that affect the duration of the air tanks usefulness

_____

_____

10. Self-contained breathing apparatus cannot protect against one of the following:

(Circle letter at the correct answer)

a. Oxygen deficient atmospheres

b. Gases which can be absorbed through the skin

c. Atmosphere containing a large percentage of carbon monoxide

d. Gases which attack mucous membranes

11. The color code of the "Main-Line valve is:

(Circle the letter at the correct answer)

a. red

b. green

c. blue

d. yellow

12. Briefly explain the operation of the demand regulator type of breathing apparatus.

_____

_____

13. In normal use of demand regulator type of breathing apparatus, the "main-Line" valve should be _____ and _____.

(Circle the letter at the correct answer)

a. closed-locked

b. open-unlocked

c. open-locked

d. open-pressurized

14. The so-called 30-minute breathing apparatus should be expected to last _____ for every 100 psi as indicated on cylinder gauge.

(Circle letter at the correct answer)

a. 1 minute

b. 3 minutes

c. 5 minutes

d. 4 minutes

15. Briefly explain the use of "By-Pass" valve due to malfunction of regulator

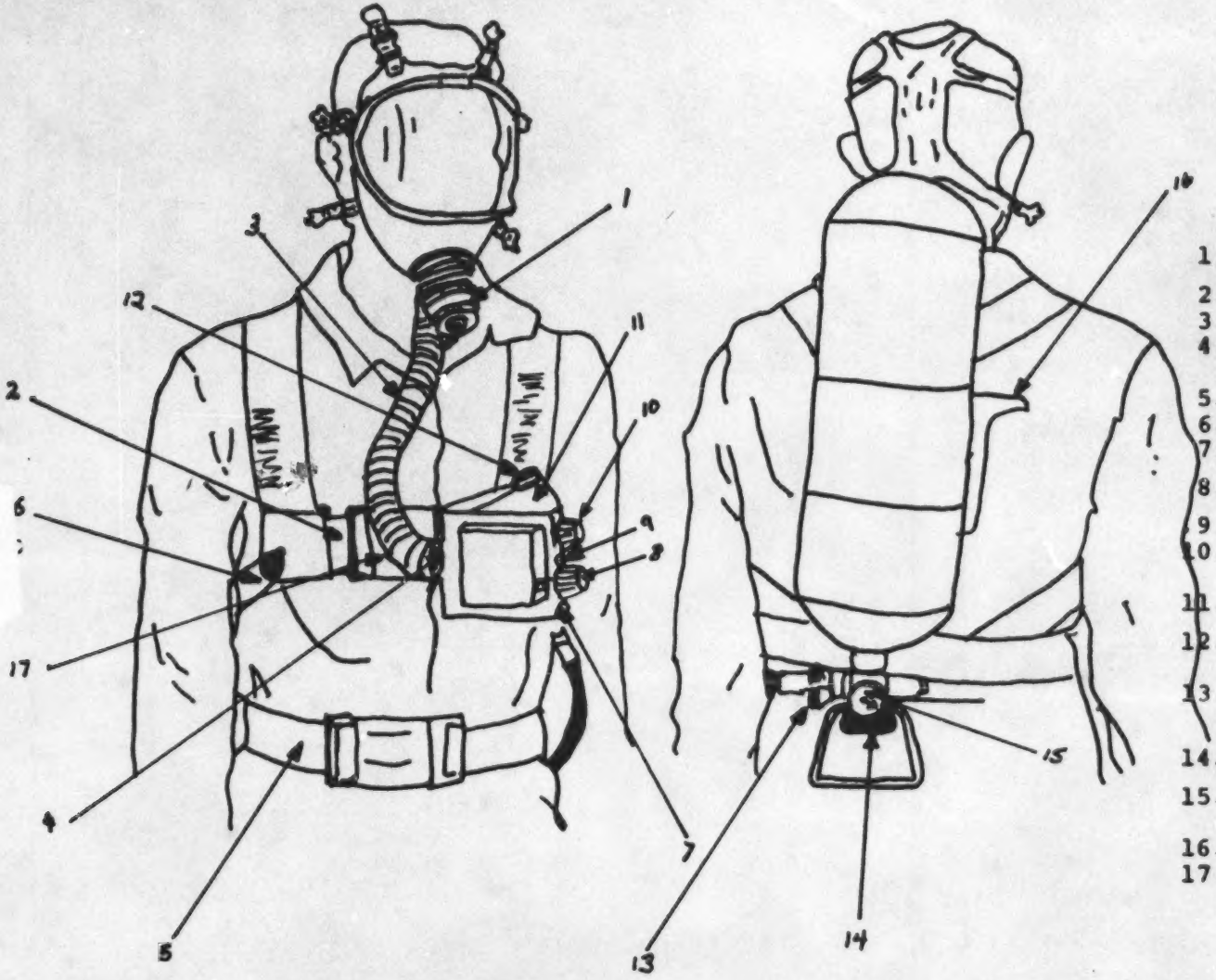
_____

_____

_____

16. Label the part at #1
17. Label the part at #8
18. Label the part at #10
19. Label the part at #11
20. Label the part at #14

Please print answer in the space provided.



1. _____
2. Chest Strap
3. Breathing Tube
4. Quick Connect Coupling
5. Waist Belt
6. Side Strap
7. Locking Tab
8. _____
9. Control Lever
10. _____
11. _____
12. Regulator Pressure Gauge
13. Regulator Hose Coupling
14. _____
15. Cylinder Pressure Gauge
16. Cylinder Clamping Lever
17. Chest Buckle Plate

ANSWER KEY

1. Smoke filled buildings
   Man holes/sewers
   Underground vaults or Pits
   Halon filled rooms
   Ship Holds
   Underground Tunnels

2. c. over exertion

3. die

4. oxygen generation formed by chemical reaction

5. ammonia
   carbon dioxide
   hydrogen cyanide
   carbon monoxide
   hydrogen sulfide
   sulfur dioxide

6. Exhaled air of wearer is "scrubbed" and cooled then reused

7. b. reduces-feeds

8. Maintenance of a slight positive pressure at all times in the facepiece

9. Air pressure in tank at start
   Air consumption by the individual

10. b. Gases which can be absorbed through the skin

11. d. yellow

12. Demand regulator reduces pressure from storage cylinder and feeds air to wearer on demand

13. c. open-locked

14. a. 1-minute

15. Open by-pass valve slowly just to a point where breathing is comfortable

    Close "Main-Line" valve

    Take a deep breath, hold it, shut off by-pass valve until another breath is needed.

16. Inhalation valve

17. Main-line valve

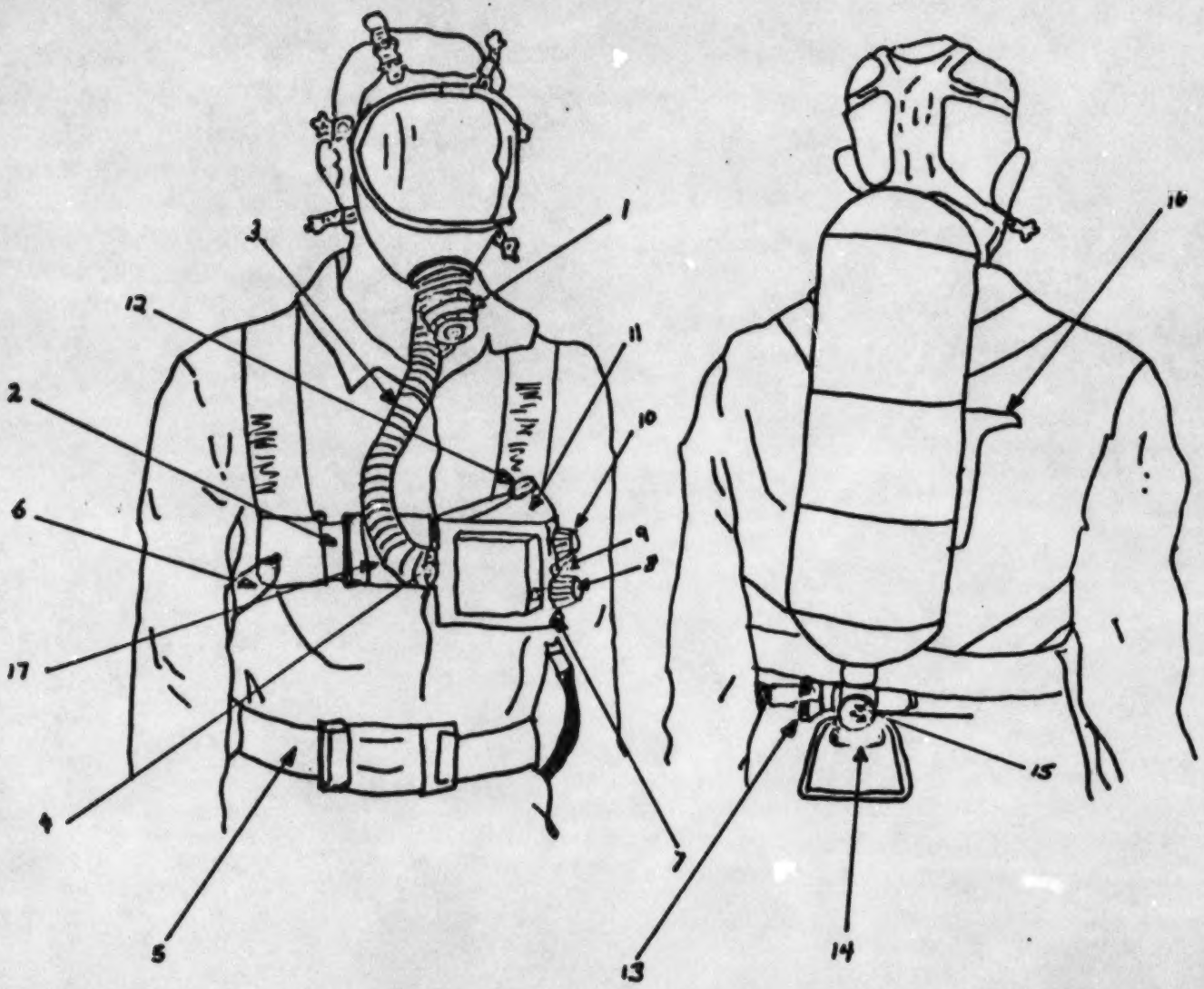
18. By-pass valve

19. Demand regulator

20. Cylinder valve

SAFETY CHECK LIST

- Be in good health and physical condition - fire fighters with respiratory ailments should not perform duties requiring the use of breathing apparatus.
- Do not use breathing apparatus when overexerted or after exposure to other gases.
- Work at a rate which will prevent overexertion and unnecessary air use while in contaminated areas.
- Check the face-to-mask seal to assure there are no leaks.
- Check operation of unit before entering toxic atmosphere.
- Always work in pairs.
- If possible, stay in contact with hose or lifeline.
- Be well trained in self-contained breathing apparatus use.
- Know the limitations of the equipment.
- Recognize your own limitations
- Allow time to get out of the building before the air supply is exhausted.



1. Inhalation Valve
2. Chest Strap
3. Breathing Tube
4. Quick Connect Coupling
5. Waist Belt
6. Side Strap
7. Locking Tab
8. Main Line Valve
9. Control Lever
10. By-Pass Valve
11. Demand Regulator
12. Regulator Pressure Gauge
13. Regulator Hose Coupling
14. Cylinder Valve
15. Cylinder Pressure Gauge
16. Cylinder Clamping Lever
17. Chest Buckle Plate